BLM LIBRARY
88009594

WILDLIFE TECHNICAL REPORT

Anaconda Nevada Moly Project

TD
195
.M5
U522

Bureau of Land Management
Library
Denver Service Center

7928157

8609594

TD
195
.M5
U522

WILDLIFE TECHNICAL REPORT

Support Document for the

Draft Environmental Impact Statement

Anaconda Nevada Moly Project

Lead Agency

U.S. Department of the Interior
Bureau of Land Management
Nevada State Office
P. O. Box 12000
Reno, Nevada 89520

Bureau of Land Management
Library
Denver Service Center

Prepared by

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
FORT COLLINS, COLORADO

Bureau of Land Management
Library
Denver Service Center

PREFACE

The Anaconda Copper Company of Denver, Colorado, plans to develop an open pit molybdenum mine and flotation mill plant on privately owned land and public land on which the company has located mining claims under the general mining laws, approximately 18 miles north of the town of Tonopah, located in Nye County, Nevada. In order to supply power to the Anaconda project, Sierra Pacific Power Company of Reno, Nevada, has filed with the U.S. Bureau of Land Management (BLM) an application for a right-of-way to construct and operate a 230kV electric transmission line which would cross 86 miles of public land in the Big Smoky Valley in Nye and Lander Counties. Sierra Pacific's right-of-way application initiated BLM's environmental analysis process and the decision was made to prepare an Environmental Impact Statement (EIS) on the proposed transmission line and the Anaconda mine/mill complex. The EIS is being prepared on a contract basis by Environmental Research & Technology, Inc. (ERT), of Fort Collins, Colorado.

This report was prepared by ERT as a preliminary step in the EIS preparation process. The report provides detailed information on the wildlife resources of potentially affected areas and discusses the impacts of the proposed project on these resources.

The wildlife report is one of a series of ten technical reports prepared by ERT as background and documentary material for the EIS. Each report presents the results of field and literature studies in the affected environments and results of impact analyses. The technical reports are intended as background documents and information in them is, in many cases, considerably more detailed than will be included in the EIS.

Chapter 1, "Alternatives Including the Proposed Action", can be found in the Draft Environmental Impact Statement which is on file with copies of the technical reports at the following locations: BLM offices in Washington, D.C.; Reno; Battle Mountain; Carson City; Elko; Ely; Las Vegas; and Winnemucca, Nevada. The following public libraries will also receive copies: the Churchill Public Library, Fallon; Clark County Library, Las Vegas; the Elko County Library, Elko; the Esmeralda County Library, Eureka; the Lander County Library, Battle Mountain; the Mineral County Library, Hawthorne; the Nevada State Library, Carson City; the Nye County Library, Tonopah; the Washoe County Library, Reno; and the White Pine County Library, Ely. Draft EISs will also be sent to the University of Nevada Libraries in Reno and Las Vegas.

CONTENTS

		Page Numbers
	Preface	ii
	Table of Contents	iv
	List of Tables	vi
	List of Maps	vii
1.	Alternatives Including the Proposed Action	1-1
2.	Existing Environment	2-1
	Introduction	2-1
	Regional Overview	2-1
	Mine/Mill Complex	2-2
	Big Smoky Valley	2-14
	Significant Wildlife Species and Habitats	2-14
3.	Environmental Consequences	3-1
	Assumptions and Analysis Guidelines	3-1
	The Concept of Significance	3-1
	Assumptions Regarding the Proposed Action and Alternatives	3-1
	Potential Impacts that Would Not Occur	3-3
	Effects of Implementing the Proposed Action	3-5
	Mine/Mill Complex	3-5
	230kV Transmission Line	3-6
	Effects of Implementing Alternative 1, West Smoky Valley Transmission Corridor	3-8
	Effects of Implementing Alternatives 2,3, and 4	3-8
	Relationship Between Local Short-Term Use of the Environment and the Enhancement of Long-Term Productivity	3-9
	Irreversible and Irretrievable Commitment of Resources	3-9
4.	List of Preparers	4-1
	Introduction	4-1
	Environmental Research and Technology, Inc.	4-1
5.	Consultation and Coordination	5-1

CONTENTS (CONTINUED)

		Page Numbers
6.	Appendices	6-1
	Appendix A - Methodology	6-1
	Introduction	6-1
	Mine/Mill Complex	6-1
	230kV Transmission Line	6-5
7.	Glossary	7-1
8.	References	8-1

LIST OF TABLES

Table	Title	Page
2-1	Avifauna Observed During 1978-1979 Field Studies on the Anaconda Nevada Moly Mine/Mill Site and Vicinity	2-4
2-2	Wild Mammals Occurring on the Anaconda Nevada Moly Mine/Mill Site and Vicinity, July 1978 and April 1979	2-5
2-3	Reptiles Identified on Anaconda Nevada Moly Mine/Mill Site and Vicinity, July 1978 and April 1979	2-6
2-4	Density Index and Relative Abundance of Birds Recorded on Quantitative Transects in the Saltbush-Black Sagebrush Habitat Type on Anaconda Nevada Moly Mine/Mill Site July 1978 and April 1979	2-7
2-5	Density Index and Relative Abundance of Birds Recorded on Quantitative Transects in the Galleta-Saltbush Habitat Type on Anaconda Nevada Moly Mine/Mill Site July 1978 and April 1979	2-8
2-6	Summary of Night Counts of Owls in the Vicinity of the Anaconda Nevada Moly Mine/Mill Site	2-9
2-7	Small Mammal Trapping Data	2-10
2-8	Summary of Roadside Lagomorph Surveys at the Anaconda Nevada Moly Mine/Mill Site, July 1978 and April 1979	2-11
2-9	Summary of Predator Scent Station Visitation Results for the Anaconda Nevada Moly Mine/Mill Site	2-12
2-10	Summary of Fish Habitat in the Big Smoky Valley	2-18
2-11	Summary of Known Locations of Important Aquatic-Riparian Habitat Areas in the Big Smoky Valley	2-19
2-12	Summary of Waterfowl Use Areas in the Big Smoky Valley	2-20
2-13	Summary of Status of Listed and Candidate Threatened and Endangered Fish and Wild-Life in the Vicinity of the Nevada Moly Project	2-22

LIST OF MAPS

Maps	Title	Page
2-1	Important Areas of Wildlife Habitat	2-16
A-1	Location of Sampling Areas for Wildlife Field Studies, at the Mine/Mill Complex, Anaconda Nevada Moly Project	6-4

CHAPTER 1

ALTERNATIVES INCLUDING THE PROPOSED ACTION

(Refer to the Draft Environmental Impact Statement)

CHAPTER 2

EXISTING ENVIRONMENT

INTRODUCTION

Chapter two presents a discussion of wildlife resources potentially affected by the Anaconda Nevada Moly Project, including the proposed 230 kV transmission line and alternatives. Detailed methods utilized in obtaining information are described in Appendix A. They included semi-quantitative and qualitative surveys of vertebrate populations completed in July 1978 and April 1979 at the site of the mine/mill complex; field and aerial reconnaissance of proposed and alternative transmission line locations in September-October 1979, and January 1980; review of resource information on file at U.S. Bureau of Land Management (BLM) offices in Tonopah and Battle Mountain; and discussions with wildlife biologists employed by the BLM, Nevada Department of Wildlife (DOW), U.S. Fish and Wildlife Service (FWS), and local universities.

For information gathering purposes, the affected environment was defined on two levels: site-specific and regional. Site-specific areas included for the mine/mill site, Anaconda's property at the northwest edge of the San Antonio mountains, and an approximate one-mile perimeter. For the transmission line, the affected environment was considered the Big Smoky Valley from Tonopah north to Sierra Pacific's existing 230 kV Intertie Number One. Eastern and western boundaries were considered the crests of the Toiyabe Range and the Toquima Range.

No specific boundaries were placed on the general region, as information gathering efforts at that scale were primarily directed at defining species and habitats of importance in central Nevada as a whole. Additional effort was directed at identifying wildlife populations, especially birds, whose home ranges or migration paths might bring them into contact with proposed project activities, even though the greater part of their range occurs outside potentially affected site-specific areas.

REGIONAL OVERVIEW

The Anaconda Nevada Moly Project would be located in an area representative of the southern Great Basin cold desert. The area is characterized by a series of abrupt and isolated, north-south oriented mountain ranges, separated by low, level, intermontane alluvial basins. Elevations in the Great Basin average approximately 5,000 feet; in the project vicinity, elevations range from approximately 4,700 feet in the valley to over 10,000 feet in the mountains. Soils in the valleys and basins are predominantly deep, alluvial and aridic whereas the mountains, mesas, and foothills are characterized by shallow, eroded, relatively undeveloped soils. Climate in the region is characterized by low precipitation (less than four inches in the valleys), high evaporation rates, a moderate growing season, and high daily and seasonal variations in temperature.

These abiotic factors combine to form the vegetation communities which provide habitat for wildlife. Vegetation is described in detail in a separate technical report. The region of the Anaconda Nevada Moly Project is characterized by low desert shrub vegetation: the Saltbush-Greasewood community and the Great Basin Sagebrush community (Kuchler 1964). Physiognomy of both of these communities is described by open stands of low and dwarf shrubs. Trees are absent, water is a limiting factor in many areas, and wildlife habitat is limited by compositional and structural homogeneity. The wildlife community of this cold desert situation is typified by high diversity and density of small rodents and reptiles and a relatively high density of avian and mammalian predators. Animals with a high volume to surface area ratio, such as big game ungulates, find existence difficult and are therefore found at far lower densities in comparison with other communities. Songbird communities are limited in densities and diversity by the vegetation's homogeneous structure.

All of the Nevada Moly Project's components are contained within the BLM's Battle Mountain District. Checklists published by the district office (U.S.D.I. BLM no date (a), (b), (c), (d), list 69 mammal species, 208 birds, 24 reptiles, 2 amphibians, and 19 fish species occurring in the district.

Typical species include: rodents such as deer mouse, white-tailed antelope squirrel, desert woodrat, and several species of kangaroo rat; lagomorphs such as black-tail jackrabbit, desert cottontail, and mountain cottontail; reptiles like zebra-tailed lizard, desert short-horned lizard, and sagebrush lizard; mammalian carnivores such as coyote and kit fox; raptorial birds like golden eagle, prairie falcon, and common raven; and songbirds such as black-throated sparrow, horned lark, Say's phoebe, loggerhead shrike, and sage thrasher (Yocom et al. 1958).

Additional species include mule deer which are common, though largely restricted to the mountainous areas; bighorn sheep, which are entirely restricted to the higher mountains; pronghorn, which are found in small numbers in some valleys; and mountain lion, which are found in low densities in all of the mountain ranges. Gamebirds include sage grouse, chukar partridge, and mourning dove. Waterfowl use the area during spring and fall migration.

Cooper's hawk, goshawk, and sharp-shinned hawk breed in aspen stands in the mountain drainages.

Introduced game fishes are found in some streams and several relict native fishes may occur in isolated springs.

MINE/MILL COMPLEX

The mine/mill complex for the Anaconda Nevada Moly Project would be located on a 9,000 acre tract of private land and mining claims at the northwestern edge of the San Antonio Mountains. Field studies of the wildlife resources of the property and potentially affected adjacent areas were completed in July 1978 and April 1979. Studies were designed as a detailed reconnaissance of the property, intended to qualitatively

and semi-quantitatively inventory vertebrate fauna and identify important areas of habitat. They focused on Anaconda's property but included a small spring, Liberty Springs, located about three miles south, because of the likelihood that the springs would serve as a water source for species from the surrounding vicinity and thus provide a more complete inventory of species present. Detailed methods used are described in Appendix A. They included: live trapping of small mammals; quantitative strip-transect surveys of songbirds; predator surveys using predator scent stations; night spotlight surveys of lagomorph populations; night owl surveys; intensive searches for ground and cliff nesting raptors and owls; qualitative surveys of reptile species presence; and qualitative habitat searches.

Habitats at the site are typical of the desert shrub communities described in the regional overview. Two major habitat types occur: the Saltbush-Black Sagebrush community on the steep, rocky slopes of the San Antonio Mountains; and the Galleta-Saltbush community on the level, alluvial outwash of the valley floor (see Vegetation Technical Report for details). These habitat types are characterized as low growing open shrublands with estimated ground cover of 22 percent and 25 percent respectively. Both are considered common in the region.

In addition to the two major habitat types, a minor habitat type, the Willow-Rush community occurs at Liberty Springs and rock outcrops occur east of the Anaconda property, in steep drainages and near the crest of the San Antonio Mountains. Both of these areas are considered important wildlife habitat areas by the BLM (unpublished, no date).

Results of field surveys at the mine/mill site and vicinity are summarized in Tables 2-1 through 2-9, discussed in following paragraphs. Overall composition of the vertebrate fauna was as expected and entirely typical of Great Basin cold desert communities. Twenty-one species of birds, sixteen species of mammals, and eleven reptiles were identified through direct observation or recording of definitive sign. These species are listed in Tables 2-1, 2-2, and 2-3. No amphibians were recorded and no fish habitat occurs on the site or in the vicinity.

Of the 21 bird species observed (Table 2-1), only nine are expected to breed on the mine/mill site; the remainder were observed flying over the site only or were probably migrants passing through the area. Several species such as the black phoebe and house finch were observed only at Liberty Springs and, like yellow-headed blackbird and brown-headed cowbird, are typical of aquatic-riparian habitat areas of the Great Basin. Bird species of interest recorded during the field studies included the golden eagle, American kestrel, prairie falcon, chukar, mourning dove, and burrowing owl. Additionally, short-eared owls and Swainson's hawk were observed from the road while driving from Tonopah to the site. The most abundant species of the mine/mill site, as shown by results of quantitative surveys, summarized in Tables 2-4 and 2-5, were the rock wren and black-throated sparrow in the Saltbush-Black Sagebrush habitat and the black-throated sparrow and horned lark in the Galleta-Saltbush habitat type. Overall numbers were low in both habitats, though they were much greater in the Galleta-Saltbush areas. Differences in numbers observed in July 1978 and April 1979 reflect the differences

TABLE 2-1

AVIFAUNA OBSERVED DURING 1978-1979 FIELD STUDIES ON THE ANACONDA NEVADA MOLY MINE/MILL SITE AND VICINITY

Species	Mine/Mill Site: Saltbush-Black Sagebrush Community	Mine/Mill Site: Galleta-Saltbush Community	Adjacent Areas: Liberty Springs	Adjacent Areas: Flyover only
Hawks, Vultures, Falcons				
Turkey vulture				X
Golden eagle				X
American kestrel				X
Prairie falcon				X
Partridges				
Chukar[a]	X		X	
Doves				
Mourning dove			X	
Owls				
Burrowing owl[a]		X		
Goatsuckers				
Poor-will[a]		X		
Songbirds				
Say's phoebe[a]	X	X	X	
Black phoebe			X	
Western kingbird[a]	X	X	X	
Horned lark[a]	X	X	X	
Common raven				X
Rock wren[a]	X			
Loggerhead shrike[a]	X	X	X	
Yellow-headed blackbird		X		
Brown-headed cowbird		X		
House finch			X	
Black-throated sparrow[a]	X	X	X	
Vesper sparrow		X		
White-crowned sparrow		X		

[a] These birds probably breed on Anaconda's property.

TABLE 2-2

WILD MAMMALS OCCURRING ON THE ANACONDA NEVADA MOLY MINE/MILL SITE AND VICINITY, JULY 1978 AND APRIL 1979

Common Name	Comment
Rabbits and Hares	
Black-tailed Jackrabbit	Ubiquitous
Desert Cottontail	Ubiquitous
Squirrels	
White-tailed Antelope Squirrel	Ubiquitous
Heteromyids	
Long-tailed Pocket Mouse	Live trapped
Chisel-toothed Kangaroo Rat	Live trapped
Desert Kangaroo Rat	Live trapped
Merriam's Kangaroo Rat	Live trapped
Ord's Kangaroo Rat	Live trapped
New World Rats and Mice	
Cactus Mouse	Pitfall trapped
Deer Mouse	Live trapped
Pinon Mouse	Live trapped
Desert Woodrat	Live trapped
Canids	
Coyote	Observed and sign
Kit Fox	Observed and sign
Mustelids	
Badger	Road-kill near Tonopah, report of Anaconda personnel.
Cervids	
Mule Deer	Pellet groups and tracks within 2 miles of the ore body.

TABLE 2-3

REPTILES IDENTIFIED ON ANACONDA NEVADA MOLY MINE/MILL SITE AND VICINITY, JULY 1978 AND APRIL 1979

Common Name	Comments
Lizards	
Collared lizard	Very common
Desert horned lizard	Very common
Desert spiny lizard	One individual found along road to Liberty Springs
Leopard lizard	Common
Sagebrush lizard	One individual found East of Liberty Springs
Side-blotched lizard	Common
Western whiptail	Common
Zebra-tailed lizard	Very common
Snakes	
Common kingsnake	One individual found on road to site
Gopher snake	One individual found on road on site
Western rattlesnake	Observed by soil survey crew

TABLE 2-4

DENSITY INDEX AND RELATIVE ABUNDANCE OF BIRDS RECORDED ON QUANTITATIVE TRANSECTS IN THE SALTBUSH-BLACK SAGEBRUSH HABITAT TYPE ON ANACONDA NEVADA MOLY MINE/MILL SITE

JULY 1978 AND APRIL 1979

	July 1978			April 1979		
Species[1/]	Total Observations	Density Index (No./100 acres)	Relative Abundance	Total Observations	Density Index (No./100 acres)	Relative Abundance
Rock wren	15	10	59%	7	5	100%
Black-throated sparrow	9	6	35	--	--	--
Say's phoebe	1	<1	6	--	--	--
Total		17			5	

[1/] Additional species listed in Table 2-1 were not observed on the quantitative transects, but were seen during other field activities.

TABLE 2-5

DENSITY INDEX AND RELATIVE ABUNDANCE OF BIRDS RECORDED ON QUANTITATIVE TRANSECTS IN THE GALLETA-SALTBUSH HABITAT TYPE ON ANACONDA NEVADA MOLY MINE/MILL SITE

JULY 1978 AND APRIL 1979

Species[1/]	July 1978			April 1979		
	Total Observations	Density Index (No./100 acres)	Relative Abundance	Total Observations	Density Index (No./100 acres)	Relative Abundance
Black-throated sparrow	49	66	72%	24	17	71%
Horned lark	20	24	26	7	5	21
Say's phoebe	1	<1	1	1	<1	4
Rock wren	1	<1	1	--	--	--
Loggerhead shrike	--	--	--	1	<1	4
Total		92			24	

[1/] Additional species listed in Table 2-1 were not observed on the quantitative transects, but were seen during other field activities.

TABLE 2-6

SUMMARY OF NIGHT COUNTS OF OWLS IN THE VICINITY OF THE ANACONDA NEVADA MOLY MINE/MILL SITE

Date	Species	Number
July 18, 1978	Burrowing Owl	1
July 19, 1978	Burrowing Owl	7
April 18, 1979	Burrowing Owl	1
April 19, 1979	Burrowing Owl	1

TABLE 2-7

SMALL MAMMAL TRAPPING DATA[1/]

Location Species	July 1978 Number	July 1978 Relative Abundance	April 1979 Number	April 1979 Relative Abundance	Overall Total Number	Overall Total Relative Abundance
Ore Body						
Deer mouse	32	43.8%	8	57.1%	40	45.9%
White-tailed antelope squirrel	13	17.8	1	7.1	14	16.1
Long-tailed pocket mouse	9	12.3	2	14.3	11	12.6
Merriam's kangaroo rat	8	11.0	3	21.5	11	12.6
Pinon mouse	5	6.8	--	--	5	5.7
Desert woodrat	4	5.5	--	--	4	4.6
Ords kangaroo rat	2	2.8	--	--	2	2.5
Total	73	100.0	14	100.0	87	100.0
Plant Site						
Deer mouse	24	35.8	3	21.4	27	33.4
Merriam's kangaroo rat	23	34.3	6	42.9	29	35.8
White-tailed antelope squirrel	8	11.9	--	--	8	9.9
Ord's kangaroo rat	6	9.0	2	14.3	8	9.9
Desert kangaroo rat	3	4.5	--	--	3	3.7
Long-tailed pocket mouse	1	1.5	3	21.4	4	4.9
Pinon mouse	1	1.5	--	--	1	1.2
Chisel-toothed kangaroo rat	1	1.5	--	--	1	1.2
Total	67	100.0	14	100.0	81	100.0
Liberty Springs						
Deer mouse	10	43.5	6	66.7	16	50.0
Ord's Kangaroo rat	7	30.4	1	11.1	8	25.0
White-tailed antelope squirrel	6	26.1	2	22.2	8	25.0
Total	23	100.0	9	100.0	32	100.0

[1/] New captures only. Overall new capture success was 47.25 percent in July 1978 and 9.3 percent in April 1979. Total capture success was 60.0 percent in July 1978 and 14.6 percent in April 1979.

TABLE 2-8

SUMMARY OF ROADSIDE LAGOMORPH SURVEYS AT THE ANACONDA NEVADA MOLY MINE/MILL SITE, JULY 1978 AND APRIL 1979

Date	Species	Number of Observations	Density (mile^2)
July 18, 1978	Black-tailed jackrabbit	6	124
July 19, 1978	Black-tailed jackrabbit	12	250
Average			187
April 18, 1979	Black-tailed jackrabbit	7	138
	Cottontail rabbit	1	N/A
April 19, 1979	Black-tailed jackrabbit	4	85
Average			90

TABLE 2-9

SUMMARY OF PREDATOR SCENT STATION VISITATION RESULTS FOR THE ANACONDA NEVADA MOLY MINE/MILL SITE

Date	Visits by Species
July 19, 1978	1 coyote visit 1 kit fox visit
July 20, 1978	No predators
April 17, 1979	No predators
April 18, 1979	2 coyote visits 4 kit fox visits

in timing of the surveys. The July survey occurred after the breeding season and many immature birds were recorded. The April survey occurred early in the breeding season just as birds were establishing territories.

Intensive search of all cliff faces and other potential nest sites on Anaconda's property and within a one-mile perimeter revealed no nest sites for these or other raptor species. The DOW records no raptor nest sites near the mine/mill site (Herron, personal communication, 1979b; Turner, personal communication, 1980) and it appears that use of the vicinity is restricted to hunting. Burrowing owls were recorded during night surveys (Table 2-6) and it is likely that they breed on-site, although intensive search in April 1979 for nest sites of these or other ground nesting species revealed no nests.

In all, 16 wild mammals were confirmed onsite or in the general vicinity. Additionally, two domestic animals (cattle and horses) were confirmed. Occurrence was established either through actual observation during field activity or positive identification of sign (tracks or scat). Table 2-2 lists mammalian species confirmed and notes pertinent observations.

Small mammal trapping efforts (Table 2-7) revealed expected diversity, habitat affinities, and densities of rodents (60% trap success during a peak population period - July; 14.6% trap success during a low population period - April). Deer mice were ubiquitous and ranked first in relative abundance. Merriam's kangaroo rat and antelope ground squirrel ranked second and third respectively in relative abundance. Habitat affinities and distribution for pocket mice and kangaroo rats were found to be as expected. Long-tailed pocket mice, pinyon mice, and desert woodrats were found predominantly in rocky habitat exhibited by the ore body. Kangaroo rats were predominantly, although not exclusively, found in the outwash flats of the mill site. The cactus mouse, caught in a pitfall trap in July, 1979, is near the limits of its range with respect to the project area. However, the habitat on the project area appears to meet the needs of at least a marginal population.

Diversity of small mammals at Liberty Springs was not as high as expected, probably because sampling effort was less than that for the other habitats; however, the trap success ratios were consistent, suggesting no difference in density between habitats.

Medium-sized mammals (Table 2-8) were also found at expected densities. Black-tailed jackrabbits were commonly observed and exhibited densities of approximately 188 animals per square mile during the July sampling trip. Populations were slightly lower (as expected) in April. Cottontails and jackrabbits were infrequently seen during daylight, but often left their tracks at predator scent stations.

A coyote was observed just after sunset near a playa area southwest of the site, and coyote tracks were left at a predator scent-station on one occasion in July and twice in April (Table 2-9). Kit fox were observed during each night spotlight survey. Kit fox scat and tracks were found at a scent station 2.5 miles due west of the mine site in July and at four scent stations in April, and tracks were found near the Liberty Mine.

Big game observations were extremely scarce. No evidence of big game use was found onsite; two old pellet groups (deer) were found in July in a ravine approximately two miles east-southeast of the ore body. Fresh tracks were observed near Libery Springs in April and relatively fresh pellet groups (less than one year old) were observed near the ruins due east of the Hall mine.

Observations of reptiles are summarized in Table 2-3. Species of reptiles encountered were as expected; however, no amphibians were found. In all, 11 species of reptiles (3 snakes, 8 lizards) were identified.

BIG SMOKY VALLEY

Information on the wildlife resources of the proposed and alternative transmission line route was gained primarily through review of existing information contained in unit resource analyses prepared by the BLM and in maps of important wildlife areas prepared by DOW. This information was supplemented by September 1979 and January 1980 ground reconnaissance and October 1979 aerial overflight. Reduced field effort for the area potentially affected by the transmission line was felt to be adequate due to the reduced potential for impact, in comparison with the mine/mill site. Emphasis was placed on determining locations of potentially sensitive habitat areas.

As noted previously, the potentially affected environment, in terms of potential habitat disturbance, included the Big Smoky Valley, up to the crests of the Toiyabe and Toquima ranges. The adjacent mountains were studied in order to identify species which primarily inhabit the mountains, but also utilize valley habitats.

Within these boundaries, the Big Smoky Valley is a typical example of an alluvial valley in the Great Basin. Predominant vegetation types as described in the vegetation technical report and mapped by the BLM (unpublished, no date) are desert shrub, including Big Sagebrush, Shadscale, and Black Greasewood. Adjacent mountain vegetation consists of the pinyon-juniper type, and aspen stands occur in many of the mountain drainages.

Species occurring in the Big Smoky Valley are as described in the Regional Overview. Significant areas of wildlife habitat and significant species are discussed in the following section.

Significant Wildlife Species and Habitats

Although there are many species and wildlife habitats within the area potentially affected by the Proposed Action and alternatives, definition of a relative few of them as significant helps to focus attention on those which are potentially most sensitive to adverse impact or are of most concern to state or federal wildlife agencies and the public. In determining significant species and habitats potentially affected by the Nevada Moly Project, consideration was given to the "significant species" list prepared by the BLM for the Battle Mountain District, the classification system used by the DOW (game animals,

furbearers, protected species, rare animals, and endangered animals), and the FWS list of threatened and endangered species. Based on these lists and discussions with wildlife biologists familiar with the area (Herron, personal communication, 1980; Sykes, personal communication, 1980; Mason, personal communication, 1980), the significant wildlife species and habitats of the project region were defined.

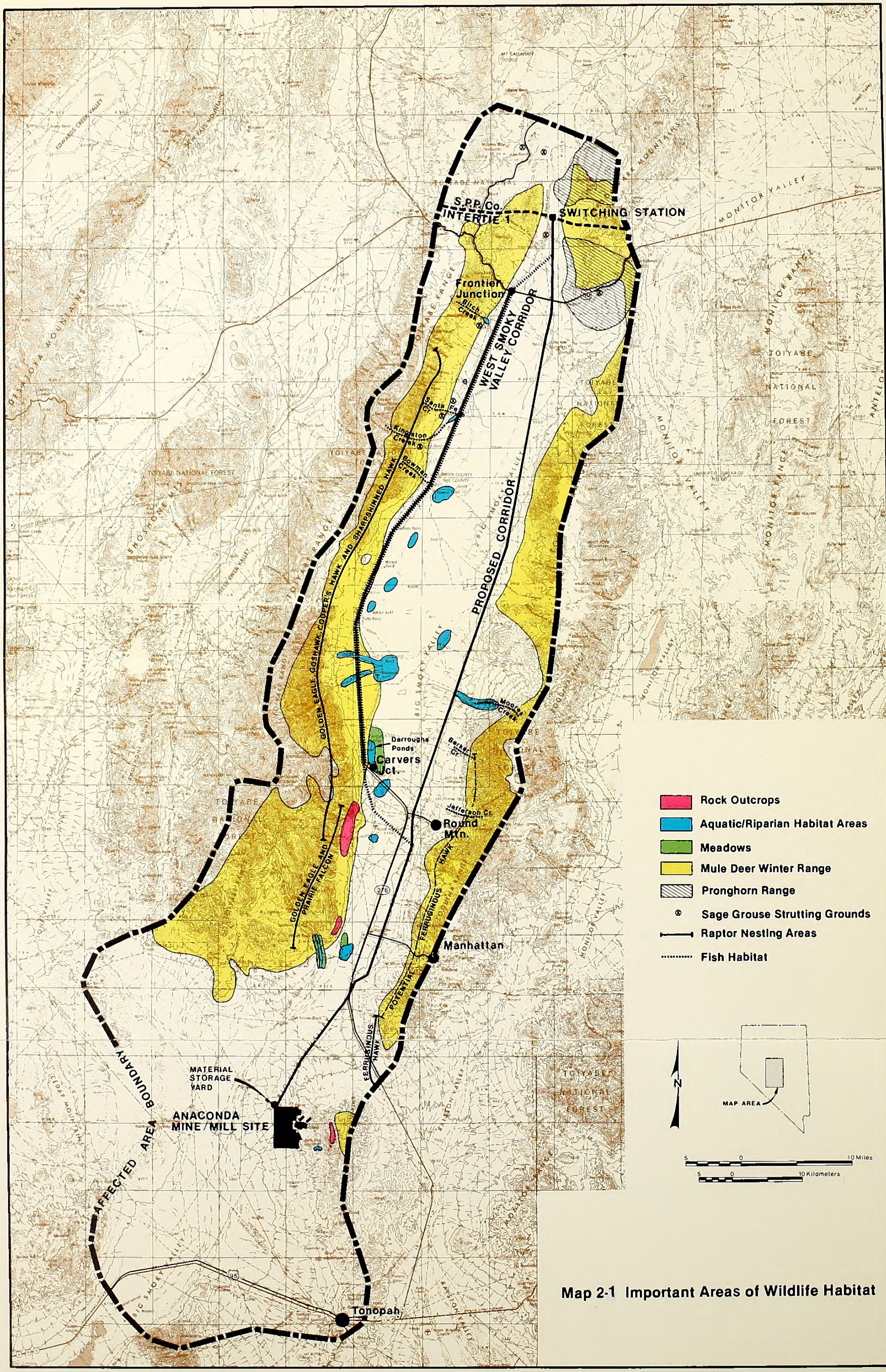
Significant wildlife habitats in the area potentially affected by the Proposed Action and alternatives are shown on Map 2-1. These areas are a mix of (1) areas of importance to a species; and (2) habitat types that are of crucial importance to a variety of species. Significant habitats are briefly discussed below:

- Pronghorn Winter and Summer Range - Two areas at the northern edge of the Big Smoky Valley are used by a small herd (approximately ten) of pronghorn (U.S.D.I., no date). Pronghorn are few in number in Nevada so the range of this small herd is important (Map 2-1).

- Mule Deer Winter Range - Mule deer are relatively common in the region, but are primarily restricted to the higher elevations. Areas on the western side of the Big Smoky Valley, mapped on Map 2-1, are used by mule deer during winter. The winter range extends up into the mountains and varies in extent with winter snowfall. The BLM and DOW show records of a winter distribution of mule deer in the San Antonio Mountains. Actual herd size is unknown and use is thought to be intermittent. The BLM wildlife management plan for the area has alloted 511 animal unit months (AUMs) for deer; this would support a herd of approximately 50 animals (Ballantyne, personal communication, 1979; BLM, unpublished, no date).

- Sage Grouse Strutting Grounds - Mapped strutting grounds and surrounding nesting habitats are essential habitat for breeding success of this important gamebird. One ground at the north end of the transmission line is located within one-half mile of the proposed corridor. All other areas are at least one mile away from either the proposed or alternate route.

- Raptor Nesting Areas - The slopes of the Toiyabe and Toquima ranges, particularly the Toiyabe, contain many areas with rock outcrops and aspen stands and are considered to provide some of the best raptor habitat in Nevada (Herron, personal communication, 1979). Rock outcrops in the Toiyabe Range provide nesting habitat for several pairs of golden eagles and prairie falcons. Aspen stands support numerous goshawks, Cooper's hawks, and sharp-shinned hawks. The area designated for ferruginous hawks (Map 2-1) includes the transitional zone between the open shrub and the pinyon-juniper type along the south end of the Toquimas. A known nest site occurs in this area. Intensive search of the mine/mill complex and a one-mile perimeter revealed no raptor or owl nests, although burrowing owls were sighted on the property and may nest in areas to be disturbed. The DOW records no raptor nests in the



Map 2-1 Important Areas of Wildlife Habitat

vicinity of the mine/mill complex (Herron, personal communication, 1979).

- Fish Habitat - Aquatic habitat is extremely limited in the Big Smoky Valley. Seven streams in the Big Smoky Valley have habitat for fishes and contain a variety of introduced trout species (Table 2-10 and Map 2-1). Of the seven, only two have fish habitat below the crossing of the proposed or alternate transmission line: Kingston and Bowman Creeks on the west side of the valley. Habitat in the others deteriorates above the crossings as the streams become intermittent or ephemeral in the valley floor (U.S.D.I., BLM no date).

  In addition to the streams, Darroughs Ponds contain bluegill and a number of other unmapped ponds contain introduced species. One spring on the west side of the valley contains two fishes which are candidates for listing as threatened and endangered species. The location of the spring is not mapped because it is thought to be the only place in the Big Smoky Valley where the Big Smoky Valley speckled dace and the Tui chub still survive (Lugaski, personal communication, 1980). The spring is located more than two miles from the proposed transmission line route.

- Aquatic and Riparian Areas - These areas include the few streams and springs of the region as well as stock ponds and reservoirs developed on private land (Table 2-11 and Map 2-1). Their importance stems from the limited occurrence in the region of the riparian vegetation type and their use as a water source for many animals. Aquatic and riparian areas are the only habitat areas for fishes and other aquatic species. In central Nevada, these areas, together with seasonally wet playa areas, also serve as important resting stops for waterfowl (geese and dabbling ducks, primarily) and shore birds on their fall and spring migrations (Table 2-12 and Map 2-1).

- Rock Outcrops and Cliffs - As stated under raptor nest sites, these areas, found on the steep slopes of the mountain ranges, are important as nesting areas for golden eagles, prairie falcons, and other raptorial birds. The majority of the rock outcrops occur in the mountain ranges, well away from the area potentially affected by the transmission line routes or mine/mill. One occurs in the San Antonio Mountains, east of the mine/mill site.

- Meadows - Grassy meadows or pastureland, either in valleys or upland areas, natural or developed by man, are important because of their relative scarcity in the region. They can be especially important as brooding areas (upland meadows) or strutting grounds for sage grouse.

In addition to the significant species mentioned in the above discussions, several other wildlife species are defined as significant based on their status as a threatened or endangered species or as a

TABLE 2-10

SUMMARY OF FISH HABITAT IN THE BIG SMOKY VALLEY

Name	Total Length or Area (miles/acres)	Length on BLM land (miles)	Species[1/]
Birch Creek	10.0	0.3	Br, B, Rb
Barker Creek	5.9	0.5	Rb, Br
Santa Fe Creek	5.4	1.4	Unknown
Kingston Creek[2/]	9.2	1.8	Br, B, Ct, Rb
Bowman Creek[2/]	7.7	1.7	B, Rb
Moore's Creek	9.1	0.5	B, Br, Rb, Ct
Jefferson Creek	---	1.0	Unknown
Darroughs Ponds	1 acre	None	Bg

Source: U.S.D.I. BLM, unpublished, no date.

[1/] Br = Brown trout
B - Brook trout
Ct = Cutthroat trout
Rb = Rainbow trout
Bg = Bluegill

[2/] Fish habitat in these streams extends below the crossing of the alternate transmission line route.

TABLE 2-11

SUMMARY OF KNOWN LOCATIONS OF IMPORTANT AQUATIC-RIPARIAN HABITAT AREAS IN THE BIG SMOKY VALLEY

Name[1/]	Location
Seyler Reservoir	Sections 13, 14, 23, 24, T8N, R42E
Peavine Creek	Sections 9, 16, 21, 22, 27, 28, T8N, R42E
Unnamed	Section 29, T10N, R43E
Unnamed	Sections 18, 20, T11N, R43E
Darrough's Hot Springs	Sections 7, 8, 17, T11N, R43E
Moore's Creek	Sections, 22, 25, 26, 27, T12N, R44E
Unnamed	Sections 20, 21, 28, 29, T13N, R44E
Ophir Ditch	Sections 35, 36, T13N, R42E; Sections 5,6,8, T12N, R43E; Section 1, T12N, R42E
Ditch	Sections 13, 14, T12N, R42E; Sections 7, 8, 18, T12N, R43E
Liberty Springs	Sections 16, 17, T5N, R42E

Source: U.S.D.I. BLM, unpublished, no date.

[1/] Additional areas on Map 2-1 were determined through field reconnaissance.

TABLE 2-12

SUMMARY OF WATERFOWL USE AREAS IN THE BIG SMOKY VALLEY

Name	Location	Period of Use[1/]
Big Salt Marsh Springs	Section 12, T14N, R43E	F, Sp, S
Bowman Creek Pond	Section 8, T13N, R43E	F, Sp
Carver's Station Ponds	Section 29, T10N, R43E	F, W, Sp
Charnoc Field Springs	Sections 29 and 32, T13N R44E	F, W, Sp
Cove Canyon Reservoir	Section 18, T11N, R43E	F, Sp
Darrough Hot Springs	Section 17, T11N, R43E	F, W, Sp
Decker Bob	Section 18, T14N, R43E	F, Sp, S
Millet Ranch Ponds	Section 8, T13N, R43E	F, W, Sp
Salt Marsh Hot Springs	Section 34, T14N, R43E	W
Seyler Reservoir	Sections 14 and 23, T8N, R42E	F, Sp, S

Source: U.S.D.I. BLM, unpublished, no date.

[1/] F = Fall
Sp = Spring
S = Summer
W = Winter

candidate for such listing. The species provided by FWS and a summary of their status in the project area are presented in Table 2-13. Only the bald eagle is currently listed and afforded legal protection; the remaining species are undergoing review and could be listed sometime in the future as a result of the review process. The BLM manages the candidate species on public lands as if they were officially on the list of threatened and endangered species.

TABLE 2-13

SUMMARY OF STATUS OF LISTED AND CANDIDATE THREATENED AND ENDANGERED FISH AND WILDLIFE IN THE VICINITY OF THE NEVADA MOLY PROJECT

Species[1/]	Summary of Status in Affected Area
Bald eagle	Six bald eagle sightings are on record in BLM files for the entire Battle Mountain District[2/]. Herron[3/] believes eagles may occasionally pass through the project area during winter. Turner[7/] reports three bald eagle sightings in the Big Smoky Valley.
Big Smoky Valley speckled dace	Endemic fish known only from one spring on the west side of the Big Smoky Valley[4/]. Spring is located more than 2 miles from proposed transmission line.
Tui chub	Endemic fish once known from east side of Big Smoky Valley. Now known only from spring on west side mentioned above[4/].
Desert tortoise	One sighting in BLM Battle Mountain District, southeast of Tonopah, believed to have been a pet[3/]. Herron believes northernmost extent of tortoise range is more than 50 miles south of Tonopah.
Gila monster	Not known from project area. Herron[3/] states that range does not extend as far north as project area.
White-faced ibis	May migrate over study area. Several important nesting areas occur in Nevada, but none in Big Smoky Valley or vicinity[3/].
Swainson's hawk	Three sightings on record in BLM Battle Mountain District[2/]. Two sightings on record in Nevada DOW files for Big Smoky Valley. One sighted between Tonopah and mine/mill site in July 1978[6/]. Not known to nest in Big Smoky Valley[3/].
Ferruginous hawk	Two known nests in vicinity of Big Smoky Valley[5/]. Additional nest sites may occur as Big Smoky Valley is within major ferruginous hawk range in Nevada. Prefers nest sites in pinyon-juniper at edge of broad open valleys[3/].

[1/] Species list provided by U.S. Fish and Wildlife Service Office of Endangered Species, Portland, Oregon. January 1980. The bald eagle is the only species officially listed as endangered. The other species are not afforded legal protection at present time. These species are candidates for the threatened and endangered species list and may in the future receive legal protection.

[2/] Sykes, D. February 1980. District Wildlife Biologist, BLM Battle Mountain District. Personal communication.

[3/] Herron, G. December 1979 and February 1980. Nongame Wildlife Coordinator, Nevada Department of Wildlife, Reno. Personal communication.

[4/] Lugaski, T. February 1980. PhD. candidate, Desert Research Institute, University of Nevada, Reno. Personal communication.

[5/] Mason, D. February 1980. Wildlife Biologist, BLM Tonopah Resource Area. Personal communication.

[6/] ERT Wildlife Technical Report 1980.

[7/] Turner, B. March 1980. Nongame Biologist, Nevada Department of Wildlife, Las Vegas. Personal communication.

Source: ERT EIS Team.

CHAPTER 3

ENVIRONMENTAL CONSEQUENCES

ASSUMPTIONS AND ANALYSIS GUIDELINES

In any impact assessment, a number of assumptions and evaluation criteria must be used. This first section identifies those used in assessing the consequences on wildlife resources of implementing the Anaconda Nevada Moly Project. In the analysis, three types of criteria and assumptions were used: (1) criteria related to the concept of significance; (2) assumptions regarding the design of the proposed action and (3) assumptions used in identifying impacts which theoretically are possible, but would not occur with the proposed action .

The Concept of Significance

Although this chapter identifies all impacts expected as a result of the Proposed Action, it is necessary to indicate which of these are considered "significant", a term which can have many meanings. In relation to wildlife resources, the definition of significance must consider the potential severity of the impact in both biological and social (or human) contexts. A symposium on the definition of biological significance (Buffington 1976) resulted in the following definition quoted from Thompson (1978): "A biologically significant impact is one which is long term and which results in a measurable change in carrying capacity or ultimate population size." Certain species are considered important based on their economic or recreational value or their status as a protected, rare, threatened, or endangered species. Certain habitats are considered important based on their relative scarcity in a region, or on the dependence of an important species or group of species on them. Based on these definitions, significant impacts on wildlife of the Anaconda Nevada Moly Project would be those which:

1. result in the long-term reduction or increase in the population size of significant species defined in Chapter 2; or

2. result in the long-term reduction or increase of the carrying capacity of significant habitats as defined in Chapter 2.

Assumptions Regarding the Proposed Action and Alternatives

The following assumptions were used in the impact assessment:

1. It was assumed that the Proposed Action and alternatives would be implemented as described in Chapter 1. Design specifications, facilities, emission rates, employment levels, and similar parameters would be as described. Standard operating procedures at the mine/mill complex and committed mitigation measures for the 230kv transmission line would be enforced and adequately implemented. A detailed revegetation plan would be developed and implemented at the mine/mill site. The revegeta-

tion plan would be consistent with the guidelines presented in Appendix A of the Soils Technical Report (also see DEIS).

2. Based on the discussion of impacts to soils in the Soils Technical Report, there is some uncertainty regarding the potential for successful revegetation of the tailings dam, tailings pond, and waste disposal areas of the mine/mill complex. Consequently, worst-case analysis is warranted and the assumption was made that successful revegetation of these areas would not occur. Total permanent habitat losses at the mine/mill complex are considered to be 2,521 acres under the worst-case analysis. Temporary habitat losses would total 419 acres.

3. Assumed actual disturbance within the transmission line corridors would be limited to an eight-foot wide access trail running the length of the line; 800 square-foot area at each tower site; three acres for a materials storage yard on ACC property; and four acres for the switching station. Although no permanent access road would be constructed, the future extent of use of the access trail is unknown and was therefore considered a permanent disturbance. Other permanent disturbances associated with the transmission line include four acres for the switching station. Disturbances for tower construction and for the materials storage yard were assumed to be temporary.

3. All electric distribution lines in the mine/mill complex would be constructed according to specifications that reduce the possibility of electrocution of raptorial birds (Miller et al., 1975).

4. All construction access for the 230kv transmission line would be reviewed and approved prior to construction with existing roads and trails used wherever possible. All travel would be limited to specified overland routes unless existing roads and trails are available for use. Natural grass and low brush would not be routinely removed. Only brush blade or back-blade techniques would be used in such areas to remove surface rock.

5. Clearing of the disturbed area on the 230kv transmission line would be kept to the least amount possible. Vegetation cover would not be removed from any area unless necessary for construction and approved by BLM. Hand clearing would be used in areas where the use of heavy equipment would be detrimental to existing conditions.

6. Revegetation would be required on the 230kv transmission line in areas identified by BLM on the date specified. Practice has shown that late fall is most successful, so in many instances fall seeding would be required. This will usually be accomplished during September, October, and November. Scarification of compacted areas and seeding of disturbed areas would occur after notification by BLM.

7. Inspection and evaluation of revegetation measures taken on the 230kv transmission line would be made by BLM after completion of the first growing season with further evaluation during the following growing season. If rehabilitation measures as listed above fail to become established in two growing seasons due to inadequate reseeding techniques or drought conditions, the applicant would be required to reseed the previously treated area. At the end of the two-year period following the second seeding, the applicant would be relieved of further responsibility.

8. On the 230kv transmission line route, the applicant would comply with any special requirements made by BLM for a stream system. All operations would be conducted in such a manner as would avoid permanent blockage of any drainage system; changing the character or causing the pollution or siltation of rivers, streams, reservoirs, ponds, water holes or springs; and damaging fish and wildlife resources and habitat.

9. Mobile ground equipment would not be operated in streams, ponds, springs, water holes, or reservoirs unless such operation is approved in writing by BLM.

10. Measures necessary to assure unrestricted passage and movement of fish and wildlife would be taken. No artificial structure or stream channel alteration that would cause a blockage to the movement of fish would be allowed.

11. Facilities would be located so as to provide a 300-foot minimum buffer strip of undisturbed land on each side of a stream or river, unless otherwise approved by BLM.

Potential Impacts that Would not Occur

Brief mention of potential impacts that would not occur is included to document the analysis process. Following are summaries of potential areas of impact which were examined during the analysis, and determined not to be of concern for the Anaconda Nevada Moly Project:

1. Raptor Electrocution. A 230kv transmission line does not pose an electrocution risk for raptors. Dimensions shown in Chapter 1 show that distances between conductors and any potential ground are greater than the wingspan of eagles, the largest bird in the area. Nearly all electrocutions of birds contacting power lines occur on smaller distribution lines and not on high voltage transmission lines (Thompson, 1977). Distribution lines at the mine/mill complex would be designed to prevent raptor electrocution.

2. Physiological Effects Related to Transmission Line. Oxidants potentially produced by corona discharge from electrical apparatus, including ozone and oxides of nitrogen, would not be produced in quantities harmful to animals (Thompson, 1977). Electromagnetic fields surrounding the transmission line would

have no harmful physiological effects on nearby wildlife (Thompson, 1977).

3. Toxic Effects of Tailings. The tailings pond could potentially be used by migrating waterfowl and shorebirds and by other wildlife. Use of the tailings area would be negative if tailings material were harmful to wildlife when contacted or ingested; available evidence suggests this would not be the case.

   Assuming that the quality of the tailings liquid would not be worse than that predicted in the Groundwater and Geology Technical Report, predicted quality of the tailings water would meet Federal drinking water standards except for fluoride, manganese, sulfates, and total suspended solids. These elevated levels are not high enough to cause harm to wildlife. The following supports the conclusion that the tailings pond would not harm wildlife: (1) Kienholz (1977) fed raw tailings from a similar operation in Colorado by baby chickens (as much as 20 percent of the diet) and no adverse effects on growth pattern or survivorship were noted. (2) Brown (personal communication, 1979) and Stark (personal communication, 1979) said that waterfowl use tailings ponds at molybdenum mills in Colorado and New Mexico without ill effect.

4. Adverse Effects of Groundwater Pumping on Liberty Springs. Liberty Springs is an important area of aquatic habitat southeast of the mine/mill complex (Map 2-1). As noted in the Groundwater and Geology Technical Report, recharge to the spring is derived from infiltrating precipitation in the San Antonio Mountains. Spring discharge infiltrates the alluvial apron to the west. The Liberty Spring and its recharge area are located well above the alluvial valley aquifer system. Thus, project-related groundwater withdrawal from the alluvial aquifer would not affect discharge from the spring.

5. Adverse Effects on Threatened and Endangered Animals. Of the eight species of listed and candidate threatened and endangered fish and wildlife discussed in Table 2-13, five species are documented in the vicinity of the Nevada Moly Project; bald eagle, Big Smoky Valley speckled dace, Tui chub, Swanson's hawk, and ferruginous hawk. Adverse impacts to these species would not occur for the reasons stated below:

   - Bald eagle - Sighting records reported in Chapter 2 indicate bald eagles occasionally pass through the region in winter. No concentration areas are known and prime habitat of large bodies of water does not occur. As noted above, potential for electrocution is extremely small. Habitats to be disturbed by facilities are not considered eagle habitat and are small in comparison to available habitat in the Big Smoky Valley.

- Swainson's hawk - Sighting records reported in Chapter 2 indicate Swainson's hawks are infrequent visitors in the project region. No impacts are expected for reasons stated for bald eagles.

- Ferruginous hawk - This hawk is known to nest in the Big Smoky Valley and would be sensitive to disturbance during the nesting season. Nesting habitat is primarily ecotone between the pinyon-juniper type of the mountains and the desert shrub types of the valleys. As such, known and potential nest sites would be located well away from areas to be disturbed (see Map 2-1).

- Big Smoky Valley speckled dace - This species is known from one spring on the east side of the Big Smoky Valley. The spring is located more than two miles from any disturbance associated with the Nevada Moly Project.

- Tui chub - Same situation as speckled dace mentioned above.

EFFECTS OF IMPLEMENTING THE PROPOSED ACTION

Mine/Mill Complex

Impacts to wildlife of the mine/mill site would occur through habitat loss, direct mortality, displacement of wildlife, and increased human presence.

Habitat Loss

The most severe impact of development of the mine/mill complex would be the removal or destruction of habitat and associated disturbance of adjacent areas. Mining and construction of the mill site, tailings disposal areas, and auxiliary facilities would result in the removal of 2,940 acres of wildlife habitat. Assuming that revegetation would fail on the tailings dam, tailings pond, and four waste disposal areas, long-term losses would equal 2,521 acres; the remainder would be lost for a period of approximately 30 years. All habitat to be disturbed is of the Galleta-Saltbush type or the Saltbush-Black Sagebrush Community, both of which are common habitats in the region.

Direct Mortality

Removal of habitat would result in the direct destruction of less mobile species such as small mammals, bird nestlings, and reptiles. These species and their relative abundances were discussed in Chapter 2; no species defined as significant would be subject to direct destruction at a level sufficient to affect their population levels in the region as a whole.

Displacement of Wildlife

More mobile species such as birds, coyotes, kit fox, and lagomophs would be displaced from disturbed areas and immediately adjacent areas into surrounding habitats. Some displaced species, songbirds especially, may not be able to establish themselves in adjacent areas since available breeding territory elsewhere is assumed to be already occupied or utilized to capacity. This loss can be counted as an absolute reduction in the local population.

Some displaced species including raptors and predators would probably not be impacted by the habitat removal. Raptors and mammalian predators are wide-ranging and the loss of habitat would affect only a portion of their hunting range. If food were limiting, a reduction in predator numbers proportionate to the reduction in food supply could be expected (Hariston, Smith and Slobodkin 1960); however small mammal and lagomorph surveys indicated that the prey base is diverse and abundant.

Of the significant species observed on site, burrowing owls would be the only ones that could suffer loss of nest sites. However, the abundant burrowing mammal activity in the area provides many potential nest sites. Burrowing owls can also dig their own burrows. Since burrowing owls change nest sites, no impact would be expected (Butts, 1973).

Increased Human Presence

In addition to habitat removal, increased human presence at the mine/mill site and in the region in general could result in adverse impacts to wildlife. Increased human presence increases the potential for wildlife-human interactions ranging from harassment of wildlife to increased poaching and legal harvest. Golden eagles and other raptors which utilize the vicinity for hunting are especially visible wildlife residents and could be subject to illegal shooting. This impact is unquantifiable. Other species which could face increased hunting pressure include rabbits, chukar, mourning dove, and waterfowl, but because these species have high reproductive potential these losses would be unlikely to affect overall populations.

Increased human activity also would increase the potential for vehicle-wildlife collisions. Small wildlife species such as rabbits, rodents, and reptiles would be most prone to road-kill, but populations of these animals would not be likely to be seriously affected by these losses.

230 kV Transmission Line

The primary effects of the proposed transmission line would be the temporary disturbance of wildlife habitat during construction, and the introduction of the transmission line and switching station into the environment. Two significant wildlife habitat areas would be affected.

Construction would result in the temporary disturbance of 8 acres of land at tower sites and 3 acres for the materials storage yard; and

the permanent disturbance of 4 acres for the switching station and 83 acres for the access trail. All of this would occur in various of the desert shrub habitat types, common in the region. This total area of disturbance would be distributed over 86 miles; so disturbance to any local area would be minor. Some local wildlife populations could be affected by direct destruction of small animals by construction vehicles.

Introduction of the transmission line into the environment could have a minor positive effect on raptor populations. Raptors frequently use transmission line towers as hunting perches and occasionally as nest sites. Since such sites are not currently present over much of the floor of the east Big Smoky Valley, their introduction could increase and improve the hunting ranges of eagles and other raptors. This is considered a beneficial impact, but is not significant because the extent of its occurrence is unknown.

The aquatic-riparian habitat at Moore's Creek would be crossed by the transmission line. Mitigation measures in Chapter 1 stipulate that a 300-foot buffer would be left on each side of the stream and that no towers would be built in the stream. This would limit the potential disturbance to the 8-foot access trail at a maximum. This loss of a very small area of habitat is not considered significant.

The transmission line would pass within one-half mile of a sage grouse strutting ground at the north end of the line. Although direct impacts to the strutting ground itself would not occur, adverse impacts to the birds could still result through (1) loss of nesting habitat adjacent to the ground or (2) disturbance of breeding sage grouse by eagles which may use the transmission line towers as hunting perches. The net result could be a local decrease in sage grouse nesting success.

Wildlife biologists of the BLM, Nevada Department of Wildlife, and ERT met in March 1980 to discuss the potential significance of these impacts and concluded that the loss of nesting habitat and potential for increased disturbance by raptors would probably not result in significant impacts to sage grouse populations (Molini, personal communication, 1980). However, since the specific characteristics of the site are not known, a potential for significant impact remains and it was agreed that a worst-case analysis was warranted. Under this analysis, the conclusion was that sage grouse nesting success would be significantly adversely affected.

Because of the potential for significant impacts to sage grouse, the following mitigation measures were identified. The exact boundaries of the sage grouse strutting ground and the location of nearby nesting habitat would be determined by biologists with the Nevada Department of Wildlife and BLM. If these biologists determined that significant impacts would result from the proposed transmission line, the design of the transmission line and its location would be modified as necessary to prevent significant impact. Specific measures could include relocation of the transmission line and local modification of tower design to prevent raptor use. These measures would effectively mitigate the significant adverse impacts to sage grouse.

EFFECTS OF IMPLEMENTING ALTERNATIVE 1
WEST SMOKY VALLEY TRANSMISSION CORRIDOR

Effects of the mine/mill complex would be identical to those described for the Proposed Action. Habitat losses associated with the transmission line would increase to a total of 103 acres (92 acres permanent, 11 acres temporary).

Construction of the transmission line on the West Smoky Valley Alternative would pose the same significant impacts to wildlife as the proposed corridor. The sage grouse strutting ground mentioned in the discussion for the Proposed Action is common to both alternatives (see Map 2-1). Because the exact location of the ground and adjacent nesting habitats is not known, the worst-case assumption is that nesting success would be significantly reduced by transmission line construction. This would be a significant impact, as discussed for the Proposed Action, and identical mitigation measures would be needed.

Additional impacts to wildlife would occur if the transmission line were constructed on the West Smoky Valley corridor, but these are considered insignificant. First, approximately 20 miles of mule deer winter range would be crossed. Based on the assumptions of an 8-foot wide access trail, an 800 square-foot area of disturbance at tower locations, and tower locations every 850 feet, approximately 22 acres of mule deer winter range would be disturbed over the 20 miles. This would be a reduction of less than one AUM within the range and is therefore considered insignificant. The transmission line would not present any barriers to mule deer movement.

The construction period (October through April) coincides with the period of use of the winter range and the presence of construction crews and activity would cause avoidance of adjacent areas. This would be insignificant because the crews would not be present all along the area at any one time, and the winter range extends over a much larger area on the flanks of the adjacent mountains.

The West Smoky Valley Alternative would cross several areas of aquatic-riparian habitat (see Map 2-1) which occur along streams in the corridor. Mitigation measures included in Chapter 1 preclude the placement of towers within 300 feet of the streams and would ensure the use of Highway 376 for the stream crossing, so no impact would occur. The same conclusion applies to fish habitats downstream of the crossing of Bowman and Kingston Creeks.

EFFECTS OF IMPLEMENTING ALTERNATIVES 2, 3, AND 4

Effects of implementing the remaining alternatives would be very similar to those described for the Proposed Action or Alternative 1. Alternative 2 would not change the impacts except through minor increases in habitat disturbance associated with the steel H-frame. Alternative 3 would produce impacts identical to those for the Proposed Action. Alternative 4 would increase the habitat loss at the mine/mill complex by approximately 50 acres, and the impacts associated with the transmission line would not occur.

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The Proposed Action and alternatives involve a short-term commitment of resources for the development of the mine/mill complex and the transmission line facilities. This section describes the relationship between this short-term use of the environment and potential future long-term uses. Short-term is defined as the life span of the mine/mill facility (20 years) plus a ten-year recovery period in which abandonment and recovery efforts would be completed (30-year total). The short term lasts until the year 2011. Long term is defined as the future after the year 2011.

The impacts of the proposed project on wildlife (temporary and permanent loss of wildlife habitat) would not affect the long-term productivity of the wildlife resources. Significant wildlife species or habitats would not be adversely affected.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies the irreversible and irretrievable commitments of resources resulting from the Proposed Action. The term irreversible is defined as use that is incapable of being reversed. Once something is initiated, it would continue. The term irretrievable means irrecoverable; once something is used it is not replaceable.

Under the worst-case analysis the wildlife habitat represented by the mine pit, tailings area, and waste disposal areas would be irreversibly committed as a result of the mine/mill complex (2,521 acres). Similarly, the proposed transmission line would involve an irreversible commitment of 87 acres of wildlife habitat and the alternate corridor would irreversibly commit 92 acres of wildlife habitat.

CHAPTER 4

LIST OF PREPARERS

INTRODUCTION

The following individuals had primary responsibility for preparing the technical report. Their education, project responsibilities, qualifications, and experience are summarized below.

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC.

THOMAS G. SHOEMAKER, Terrestrial Biologist

B.S. in Biology and English, Lewis and Clark College

Anaconda Nevada Moly Project: Responsible for studies of wildlife. Completed field studies at mine/mill site and reconnaissance of proposed and alternate transmission line. Senior author of Wildlife Technical Report.

Experience includes design and implementation of wildlife studies, impact assessment, and mitigation planning for strip mines, underground pipelines, oil ports and other development projects; specializes in avian studies and studies of threatened and endangered animals.

STEVEN R. VIERT, Range/Wildlife Biologist

B.S. in Wildlife Management, University of Michigan; M.S. in Range/Ecology, Colorado State University.

Anaconda Nevada Moly Project: Responsible for mammalian filed studies at mine/mill site.

Experience includes design and implementation of wildlife field studies, impact assessment, and mitigation planning for mining developments throughout the intermountain west.

CHAPTER 5

CONSULTATION AND COORDINATION

The wildlife technical discipline report was prepared by Environmental Research and Technology, Inc. (ERT) under contract to the Anaconda Copper Company. The technical report is a preliminary stage in the environmental analysis process which will lead ultimately to the publication of the Environmental Impact Statement (EIS) prepared by ERT for the Bureau of Land Management (BLM). As part of the EIS process a detailed public participation plan was prepared and consultation and coordination is an ongoing process. To date, however, the following specific activities related to the wildlife discipline have taken place as part of this coordination program.

Date	Activity
6/6/78	Preliminary visit to BLM area office in Tonopah. Review of existing resource information as a basis for scoping field studies.
7/21/79	Visit to BLM area office in Tonopah to obtain existing information on mine/mill site.
10/3/78	Conversation with Kurt Ballantyne, BLM wildlife biologist, Tonopah, regarding wildlife resources of mine/mill site and vicinity.
4/6/79	Conversation with Dorothy Mason, BLM wildlife biologist, Tonopah, regarding timing of spring field studies.
4/12/79	Same as above.
4/17/79	Meeting with Dorothy Mason, BLM wildlife biologist, Tonopah, to review field studies at mine/mill site and obtain information on known raptor use of area.

4/17/79	Meeting with Jim Lusk, wildlife biologist Nevada Department of Fish and Game, Tonopah, regarding wildlife use of mine/mill site and vicinity.
9/10/79	Letter from Glen K. Griffith, Nevada Department of Fish and Game regarding sage grouse strutting grounds near vicinity of proposed transmission line.
9/25/79	Meeting with various resource specialists BLM Battle Mountain District Office, Battle Mountain, regarding study plan for EIS and existing resource information in vicinity of proposed transmission line.
9/24/79	Meeting with Terry Retterer, Habitat Specialist, and William Molini, Upland Game Specialist, Nevada Department of Fish and Game, Reno, regarding wildlife resources in vicinity of proposed transmission line.
9/24/79	Meeting with Gary Herron, Non-game Wildlife Coordinator, Nevada Department of Fish and Game, Reno, regarding raptors and threatened and endangered species in vicinity of proposed transmission line.
9/24/79	Meeting with various resource specialists BLM Nevada State Office, Reno, regarding study plan for EIS.
9/26/79	Meeting at BLM Tonopah Resource Area Office, Tonopah, regarding existing resource information in vicinity of proposed transmission line.
10/9/79	Letter to Ron Lee, Biologist with Nevada Department of Fish and Game, Las Vegas, requesting identification of concerns regarding proposed transmission line.
10/9/79	Letter to Jim Lusk, Biologist with Nevada Department of Fish and Game, Tonopah, requesting identification of concerns regarding proposed transmission line.
11/10/79	Discussion with Dr. Eldon Kienholz, Colorado State University regarding possible effects of tailings on wildlife.
11/10/79	Discussion with Larry Brown, AMAX Corp., Colorado regarding use of tailings ponds by waterfowl at AMAX's Henderson mine and mill.

11/13/79	Discussion with Cindy Stark, Moly Corp., New Mexico regarding use of tailings ponds by waterfowl at molybdenum mine/mill near Questa, New Mexico.
2/4/80	Conversation with Wayne White, Fish and Wildlife Service regarding Fish and Wildlife Service letter on consultation requirements for Endangered Species Section 7.
2/6/80	Conversation with Gary Herron, Nevada Game and Fish, regarding wildlife in project area.
2/6/80	Conversation with Bob Sumner, Nevada Department of Fish and Game, regarding candidate vegetation species.
2/6/80	Conversation with Dwayne Sykes, BLM, regarding wildlife population in project area and significant species.
2/8/80	Conversation with Dr. James Deacon, University of Nevada, Las Vegas, regarding threatened and endangered fishes in the Big Smoky Valley.
2/11/80	Conversation with Dorothy Mason, BLM wildlife biologist, Tonopah, regarding raptor use in project area.
2/11/80	Conversation with David Koch and Tom Lugaski, Desert Research Institute, regarding endemic fishes in Big Smoky Valley.
2/11/80	Conversation with Dwayne Sykes, BLM, regarding raptor sighting in Smoky Valley.
2/11/80	Conversation with Dorothy Mason, BLM, regarding raptors in the project area.

The following Federal and State agencies and private individuals were contacted regarding wildlife resources potentially affected by the Anaconda Nevada Moly Project.

Federal Government
U.S. Department of Interior

Bureau of Land Management, Nevada State Office,
Battle Mountain District Office, Tonopah
Area Office

State Government

Nevada Department of Fish and Game representatives in
Reno, Tonopah, and Las Vegas.

Private Individuals

Eldon Kienholz, Colorado State University
Larry Brown, AMAX Corporation
Cindy Stark, Moly Corp.

CHAPTER 6

APPENDIX A

METHODOLOGY

INTRODUCTION

Methods utilized in studies and data analysis for the wildlife discipline report are detailed in this Appendix.

Field studies, literature review, and interviews with biologists with the Bureau of Land Management (BLM) and Nevada Department of Wildlife (DOW) were utilized at the site of the mine/mill complex. Literature review, interviews, and limited field reconnaissance were used to gather existing information on the proposed transmission line and alternative. The difference in level of effort between these project components was felt to be warranted due to differences in the potential for adverse effects on the wildlife resource.

MINE/MILL COMPLEX

A detailed reconnaissance of the Anaconda Nevada Moly Project site near Tonopah, Nevada was conducted from July 17 to July 21, 1978, and from April 16 to April 19, 1979. Investigations were directed toward the wildlife components of local terrestrial communities. The study's objective was to qualitatively and semiquantitatively inventory mammalian, avian, and herpetologic fauna of the site and general vicinity such that baseline conditions could be recorded. Special attention was given to determining the presence or absence of unique habitats and species of concern (rare threatened, endangered, or otherwise of interest to Bureau of Land Management or Nevada Department of Wildlife biologists.

Wildlife survey methods used included qualitative observation; semiquantitative census; search of BLM District Office files and maps; and interviews with Anaconda personnel, BLM personnel and biologists with DOW. Specific techniques used for each taxon are summarized below.

Birds

Songbirds and songbird-like birds were surveyed using both qualitative and quantitative methods. Qualitative observations were recorded during all field activities; special effort was made to qualitatively survey the Liberty Springs area to provide a more comprehensive inventory of species in the study area. Quantitative surveys were conducted using a specific-width strip transect method modified from several authors (Balph, Stoddard, and Balph 1977; Emlen 1977; Franzeb 1977; and Dickson 1978). This method provided indices of avian density which were then used to calculate relative abundance. Locations of transects are provided on Map A-1. A strip transect was located in each of two vegetation types: the higher elevation saltbush and sagebrush association of the ore body and the lower elevation saltbush and galleta association

of the mill site. Transects were placed such that microhabitats (e.g., grassy areas, draws, and washes) within the larger habitat type were traversed.

Field procedures for the quantitative transects were as follows. A single 800 meter transect was located in a homogeneous section of each habitat type. On three mornings during each sampling period, an experienced ornithologist slowly walked each transect and recorded all birds seen or heard according to their perpendicular distance from the center line (0-10 ft; 10-25 ft; 25-50 ft; 50-100 ft; 100-200 ft; 200-400 ft.). Flyovers and birds farther than 400 feet from the centerline were recorded as qualitative observations only. All transects were surveyed during periods of peak bird activity (within 3.5 hours after sunrise) during favorable weather conditions.

Density indices were calculated based on the effective detection distance (EDD) for each species in each habitat type. The EDD is defined as the distance in which all individuals of a species are assumed to have been detected by the observer and is used to define the effective census area for each species. EDD's were defined according to 1) the distribution of individual observations, or 2) where sample size was small, the professional judgement of the observer. The density index was calculated as:

$$\frac{\bar{X} \text{ observed (3 reps.)}}{\underset{\text{(both sides of transect)}}{\text{2 EDD}} \times \underset{\text{(2625 ft)}}{\text{Transect length}}} \text{ ' } 43560 \text{ sq. ft./acre} \times 100$$

Relative abundance was calculated as:

$$\%RA = \frac{\text{density of a given species}}{\text{density of all species}} \times 100$$

Night surveys for owls were conducted on two consecutive nights during each sampling period along a 5-mile road transect and were started shortly after sunset. The road transect consisted of six stops. At each stop, an observer left the vehicle, walked approximately 15 meters away from the vehicle and recorded, by species, the number of owls heard or seen during a 5-minute period. Criteria for determining owl species by vocalizations were based on the observer's experience, recordings of certain species, and information presented by Peterson (1961).

Intensive surveys for cliff nesting and ground nesting raptors were conducted in April 1979. All cliff faces and rock outcrops on potentially disturbed areas or within an approximate one mile perimeter were searched for evidence of raptor nesting activity using 7 x 35 binoculars and a 15-60x zoom spotting scope. Qualitative surveys for ground nesting raptors (occasionally ferruginous hawks nest on the ground) and owls were conducted across all disturbance sites in the galleta-saltbush

community. Several miles of transects were walked or slowly driven to search for burrows or nests. Map A-1 shows the location of areas searched.

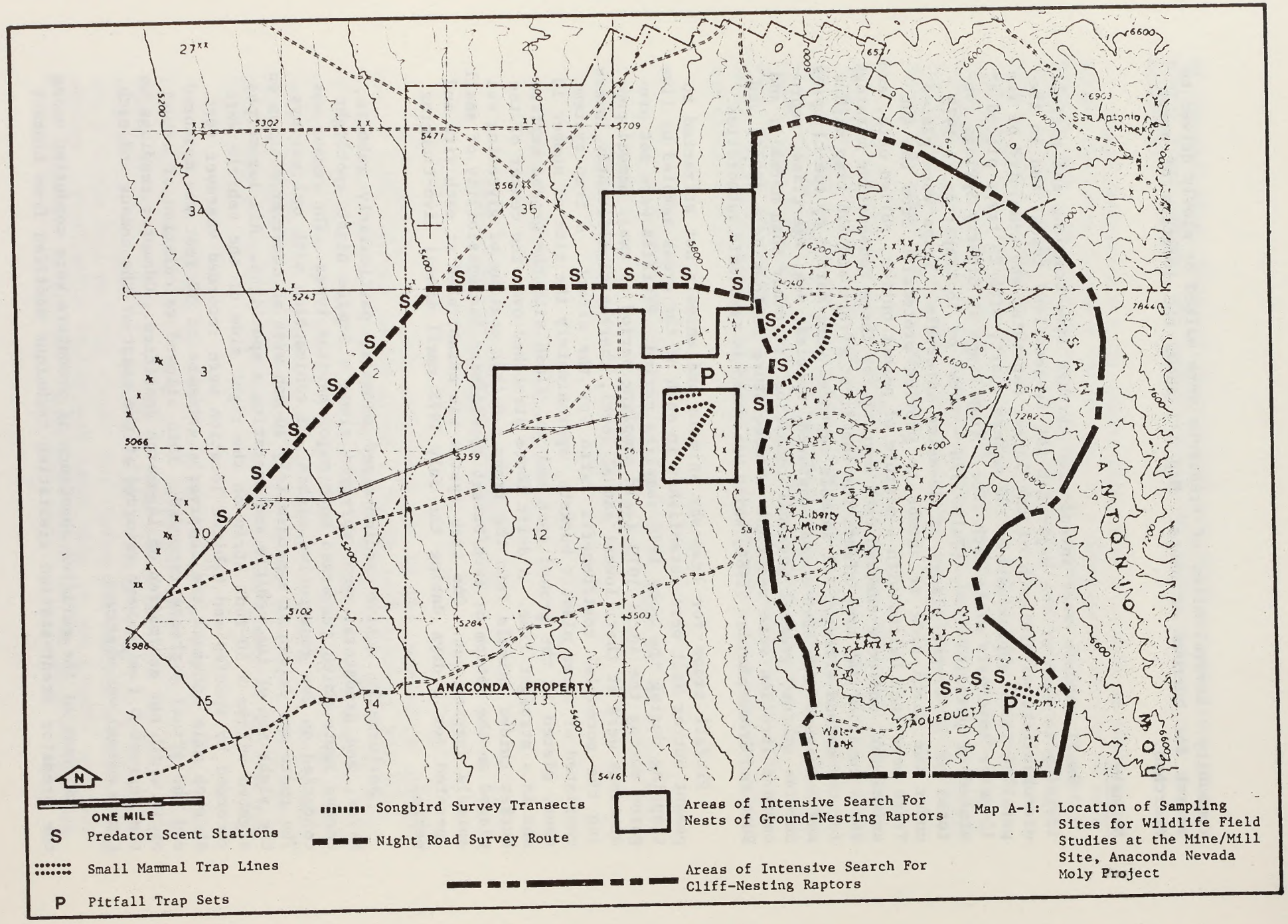
Mammals

Small mammals were inventoried through live-trapping and pitfall trapping in each of the major habitat (vegetation) types, and in the microhabitats within each of the larger habitats, and consisted of two parallel lines approximately 100 meters apart, with 25 traps placed at 15-meter intervals along each line. Trap lines at Liberty Springs consisted of parallel lines (July 1978 - total of 15 traps; April 1979 - total of 32 traps) placed at 15-meter intervals. Traps were placed under the north side of shrubs to provide protection from the sun. Traps were then baited with a mixture of peanut butter, rolled oats, and animal fat, and were checked each morning for three consecutive mornings for a total of 345 trap nights for the first effort and 396 trap nights for the second effort. All animals captured were marked by toe-clipping and released. For each animal captured, species, sex, age class, reproductive status, general physical condition (if other than normal), and capture location were recorded. Nomenclature follows Hall (1946) and Burt and Grossenheider (1964) which were used as taxonomic authorities.

Pitfall traps for trap-shy animals and animals not attracted to peanut butter bait were established in each of the areas sampled by live trapping during the July 1978 sampling period. Pitfalls were not prepared during the April 1979 field sampling period as small mammal populations were at their lowest annual level, thereby significantly lowering the potential cost/benefit ratio for the effort. A trap system consisted of three plastic buckets, approximately the size of number 10 cans, placed in the ground open end up, flush with the ground surface and in a straight line. A drift fence stretched over the center of the bucket guided animals into the traps. A thin coating of glycering was placed on the bottom of each bucket to minimize the possibility of small animals jumping out. One trap system was established at each site and operated for 2 days during the July 1978 small mammal live-trapping period.

Nocturnally active medium-sized mammals, particularly rabbits, hares, and predators, were surveyed along a 5-mile night spotlight census route which traversed both major habitat types. The census was conducted on two consecutive nights, in conjunction with owl surveys. The route was driven at approximately 10 mph with an observer sitting on the right top of the vehicle and operating a spotlight. All lagomorphs sighted within a 50-foot strip on the right side of the vehicle were recorded by species and habitat location were recorded wherever seen. At each mile interval the observer's estimate of 50 feet was measured and the actual distance recorded. This allowed calculation of actual strip width and estimation of lagomorph densities. Odometer readings to the nearest 0.1 mile were recorded at the start of the census and each time a mammal was observed.

Surveys of the relative abundance of predators were conducted using the predator scent-station visitation technique modified from Linhart



Map A-1: Location of Sampling Sites for Wildlife Field Studies at the Mine/Mill Site, Anaconda Nevada Moly Project

and Knowlton (1973). A total of 20 scent stations were established; four were located in the vicinity of Liberty Springs, 16 were spaced 0.3 miles apart along roads on and near the mine site (Map A-1). At each station, a small perforated plastic capsule containing about 1 gram of synthetic attractant was positioned in the center of a circle of sifted earth 1 meter in diameter. The capsule was supported 3-5 centimeters above ground by a thin wire rod. Scent stations were checked on two consecutive days. Animal visits based on tracks were recorded for each station, and dirt at the stations that were visited or disturbed was resifted.

Studies of big game utilization of the study area were originally planned to include pellet group counts and browse utilization studies. These activities were determined unnecessary after reconnaissance of the area indicated extremely limited use by big game. No evidence of browsing was observed and no pellet groups were found during preliminary reconnaissance. As a result, these formal studies were replaced by opportunistic observation over a larger area. Ridge lines, valley bottoms, and ravines throughout the site were intensively searched for evidence of large mammal activity (e.g., pellets, tracks, evidence of browsing).

Reptiles and Amphibians

Herpetofauna were qualitatively surveyed during other field activities and through intensive habitat searches. When necessary, lizards were stunned using a large rubber band so they could be held in hand for accurate identification.

230 kV TRANSMISSION LINE

Information on the existing environment potentially affected by the transmission line was gathered through literature review, interviews with wildlife biologists with BLM and DOW, and limited field reconnaissance.

Primary literature sources were unpublished text and maps in the Unit Resource Analyses for the Tonopah Resource Area and Shoshone-Eureka Resource Area, Battle Mountain District. Major sources of information were biologists with the NFG and maps of important wildlife values on file in the Reno office of NFG.

Field reconnaissance consisted of a driving survey of alternative and proposed transmission line routes in September 1979 and January 1980, and an aerial overflight of the Big Smoky Valley in October 1979.

CHAPTER 7

GLOSSARY

ANIMAL UNIT MONTH (A.U.M.) - The quantity of forage required by one mature cow (1000 lb.) or its equivalent for one month.

DENSITY - The number of individuals or biomass of a species per unit of habitat space (available area or volume that can actually be colonized by the population).

DIVERSITY - The number of species of organisms or the variety of communities or associations per unit area or volume.

HABITAT - The place, and the characteristics and conditions of that place, where an organism lives.

LAGOMORPH - Hares, rabits, pikas.

RAPTOR - Birds of prey, e.g., hawks, owls, eagles, falcons.

RELATIVE ABUNDANCES - Number of a given species expressed as a proportion of the total number of all species in the area.

CHAPTER 8

REFERENCES

Ballantyne, K. 1979. Personal communication. BLM Wildlife Biologist, Tonopah, Nevada. October 3, 1979.

Balph, M. H., L. C. Stoddard and D. F. Balph. 1977. A simple technique for analyzing bird transect counts. Auk 94:606.

Brown, L. 1979. Personal communication. Environmental coordinator, AMAX Co., Henderson, Colorado, November 10, 1979.

Buffington, J. D. 1976. A synthetic definition of biological significance. pp. 319-327. IN: R. K. Sharma et al. (eds). Proceedings of the Conference on the Biological Significance of Environmental Impacts. U.S. Nuclear Regulatory Commission, Washington, D.C.

Burt, W. H. and R. P. Grossenheider. 1964. A field guide to the mammals. Houghton Mifflin Company, Boston, Massachusetts.

Butts, K. O. 1973. Life history and habitat requirements of burrowing owls in western Oklahoma. M.S. thesis, Oklahoma State University.

Christenson, G. C. 1970. The Chukar partridge. Biological Bulletin #4, Nevada Department of Fish and Game. Reno, Nevada.

Dickson, J. G. 1978. Seasonal bird populations in a south central Louisiana bottomland and hardwood forest. Journal of Wildlife Management 42(4):875-883.

Emlen, J. T. 1977. Estimating breeding season bird densities from transect counts. Auk 94:455-458.

Franzeb, K. E. 1977. Inventory techniques for sampling avian populations. BLM Technical Note 307, U.S. Bureau of Land Management, Denver, Colorado.

Hall, E. R. 1946. Mammals of Nevada. University of California. Berkeley.

Hariston, N. G., F. E. Smith, and L. B. Slobodkin. 1960. Community structure, population control and competitors. American Naturalist 94:421-425.

Herron, G. 1979 and 1980. Personal communication. Non-game coordinator, Nevada Department of Fish and Game, Reno, Nevada. September and November 1979; February 1980.

Kienholz, E. 1977. Effects of environmental molybdenum levels upon wildlife. pp. 731-738. IN: W. R. Chappell and K. K. Petersen (eds.) Molybdenum in the Environment. Marcel Dekker, Inc., New York.

Kuchler, A. W. 1964. Potential natural vegetation of the conterminous United States. American Geographical Society, New York, New York.

Linhart, S. B., and F. F. Knowlton. 1973. Determination of relative carnivore densities in western United States. Annual Meeting of the American Society of Mamalogists 63. Typescript.

Lugaski, T. 1980. Personal communication. Ph.D. Candidate, Desert Research Institue, University of Nevada, Reno. February 1980.

Mason, D. 1980. Personal communication. Wildlife Biologist, BLM Tonopah Resource Area. February 1980.

Miller, D., E. L. Bocker, R. S. Thorsell, and R. R. Olendorff. 1975. Suggested practices for raptor protection on powerlines. Raptor Research Foundation, Inc., Provo, Utah.

Molini, W. A. 1980. Personal communication. Nevada Department of Wildlife, Reno, Nevada. March 1980.

Nevada Board of Fish and Game Commissioners. 1978. General Regulation No. 1(8)-Classification of wildlife. Nevada Board of Fish and Game Commissioners, Reno, Nevada.

Peterson, R. T. 1961. A field guide to western birds. Houghton Mifflin Company, Boston, Massachusetts.

Stark, C. 1979. Personal communication. Environmental coordinator, Moly Corp., Questa, New Mexico. November 14, 1979.

Sykes, D. 1980. Personal communication. District Wildlife Biologist, BLM, Battle Mountain District. February 1980.

Thompson, L. S. 1977. Overhead transmission lines: impact on wildlife. Research Report No. 2. Montana Department of Natural Resources and Conservation, Energy Planning Division. Helena, Montana.

Thompson, L. S. 1978. Transmission line wire strikes: mitigation through engineering design and habitat modification. pp. 27-52. IN: Michael L. Avery (ed.). Impacts of Transmission Lines on Birds in Flight, Proceedings of a Workshop. U.S.D.I. Fish and Wildlife Service, Washington, D.C.

Turner, B. 1980. Personal communication. Nevada Department of Wildlife, Las Vegas. Letter to T. Shoemaker, ERT. February 1980.

U.S.D.I. BLM. No date. Unpublished narrative and maps for the Unit Resource Analysis, Shoshone-Eureka Resource Area and Tonopah Resource Area, Battle Mountain District. BLM, Battle Mountain and Tonopah, Nevada.

U.S.D.I. BLM. No date(a). Fishes of the Battle Mountain BLM District. BLM, Battle Mountain, Nevada.

U.S.D.I. BLM. No date(b). Birds of the Battle Mountain BLM District. BLM, Battle Mountain, Nevada.

U.S.D.I. BLM. No date(c). Amphibians and reptiles of the Battle Mountain BLM District. BLM, Battle Mountain, Nevada.

U.S.D.I. BLM. No date(d). Mammals of the Battle Mountain BLM District. BLM, Battle Mountain, Nevada.

U.S.D.I. FWS. 1979. List of endangered and threatened wildlife and plants. Federal Register 44(12):3636-3654, January 17, 1979. U.S. Fish and Wildlife Service, Washington, D.C.

Yocom, C., V. Brown, and A. Starbuck. 1958. Wildlife of the intermountain west. Naturegraph Books, Happy Camp, California.

Bureau of Land Management
Library
Denver Service Center

Borrower's Card

TD
195
.M5
U522

Wildlife technical

Date Loaned	Borrower

Bureau of Land Management
Library
Denver Service Center